DAIKIN

altherma

Design and Application Guide

HYDRONIC HEATING, COOLING &
DOMESTIC HOT WATER

DAIKIN *ALTHERMA* 3 H HT

WARNING

Only personnel that have been trained to install, adjust, service or repair (hereinafter, "service") the equipment specifed in this manual should service the equipment. The manufacturer will not be responsible for any injury or property damage arising from improper service or service procedures. If you service this unit, you assume responsibility for any injury or property damage which may result. In addition, in jurisdictions that require one or more licenses to service the equipment specified in this manual, only licensed personnel should service the equipment. Improper installation, adjustment, servicing or repair of the equipment specified in this manual, or attempting to install, adjust, service or repair the equipment specified in this manual without proper training may result in product damage, property damage, personal injury or death.

This Design and Application Guide is
intended for **qualified and trained technicians only.**

Table of Contents

Features and Benefits of *ALTHERMA*

Innovative Technology

Sustainability
This all-electric system is designed to help reduce a home's carbon emissions, compared to fossil fuel burning systems. An added benefit if the electricity comes from renewable sources like solar and/or wind power.

All-Climate Operation.
Daikin *ALTHERMA* 3 H HT operates reliably in various climates. Space heating + domestic hot water (DHW) is possible down to -18°F (-28°C) ambient. *ALTHERMA* is designed to produce high leaving water temperatures (LWT) of up to 158°F (70°C) and provide space cooling up to 109°F (43°C) ambient.

Energy Efficient.
The Daikin *ALTHERMA* electric air-to-water heat pump provides an efficient, sustainable heating solution, supporting the transition away from fossil-fuel-based comfort systems toward all-electric energy.

Signature Technology
Daikin *ALTHERMA* 3 H HT air-to-water heat pump systems are designed with the latest technology and manufactured to exacting standards. Modern inverter-driven compressors and fan motors plus micro-processor controls deliver constant comfort and high efficiency performance.

Features and Benefits of *ALTHERMA*

Innovative Technology

Elevate possibilities.

- **Outdoor unit with self contained R-32 refrigerant circuit:** No refrigerant inside the house.
- **Packaged solution with "Plumb-and-Play" installation:** No refrigeration work required, just plumbing. The outdoor, indoor, and optional DHW tank are connected through water piping.
- **Application flexibility:** Design for flexibility with the use of different indoor emitters for heating and cooling. Ideal for retrofit and new build applications.

Elevate comfort.

Homeowners will enjoy year-round comfort:

- Able to produce water temperatures of up to 158°F (70°C)
- Operation range down to-18°F (-28°C)
- High heating capacity at low ambient temperatures

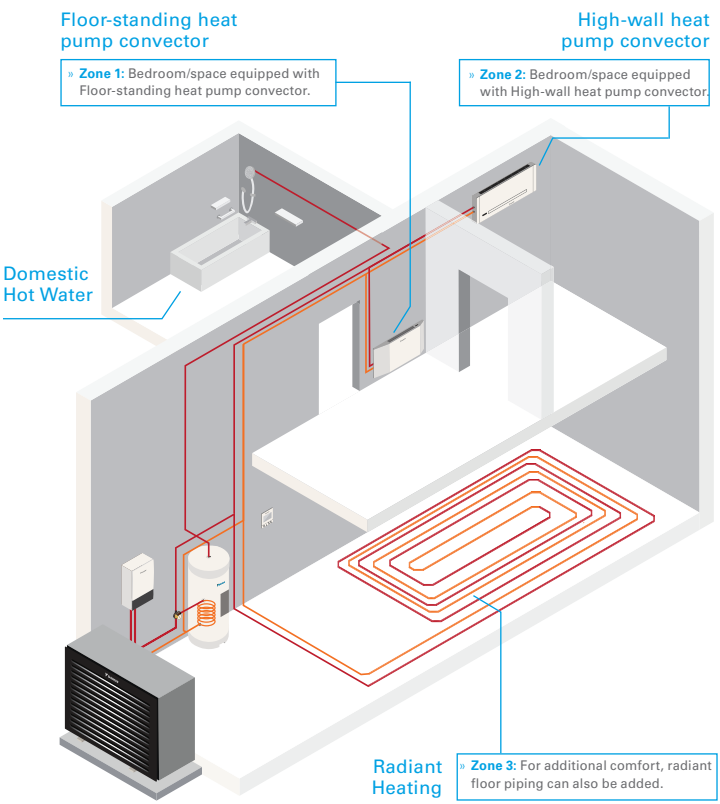
Elevate quiet.

Designed for quiet operation:

- **Standard sound mode:** the outdoor unit produces a sound pressure of 41 dBA at about 10 ft., somewhere between birds chirping and the inside of a library.
- The outdoor unit features an additional **low sound mode.** This mode helps reduce the sound pressure even further to 35 dBA, representing a reduction of half the sound level of the standard mode!

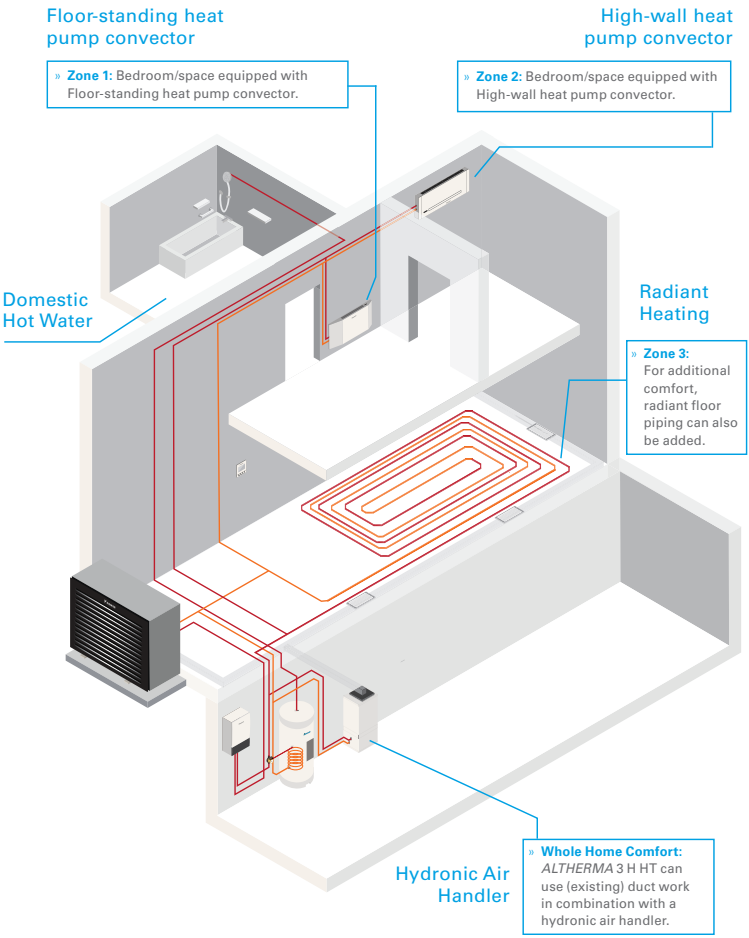
Features and Benefits of *ALTHERMA*

Innovative Technology



DUCTLESS HOME* EXAMPLE

* Visual representation of possible system connection.

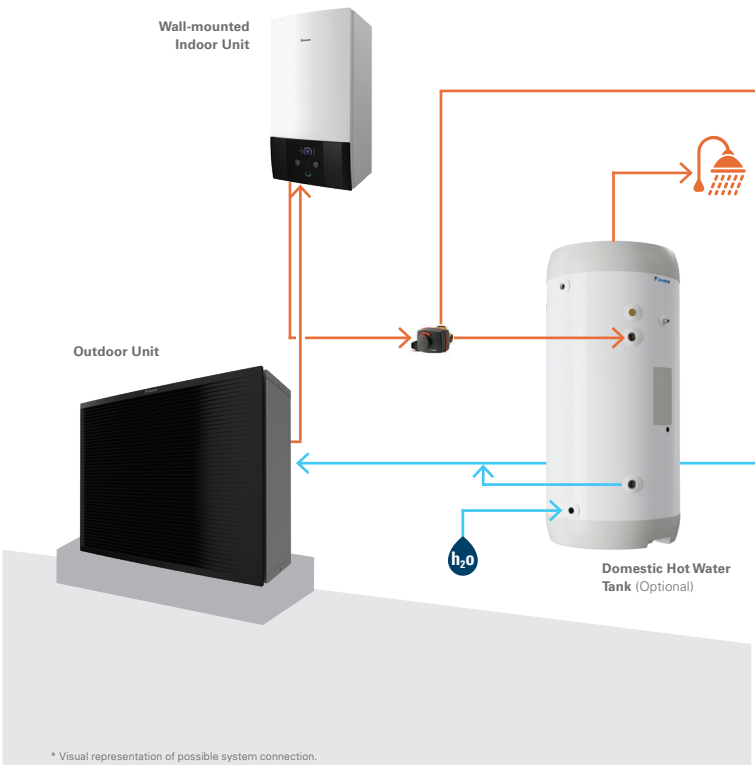


DUCTED HOME* EXAMPLE

* Visual representation of possible system connection.

Features and Benefits of *ALTHERMA*

Innovative Technology



* Visual representation of possible system connection.

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USING FIELD SUPPLIED RADIANT FLOOR

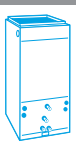
Radiant flooring

HEATING

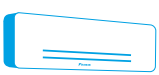
ADVANCED EFFICIENCY

Low Water Temperature

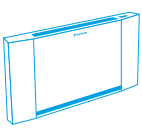
DAIKIN SUPPLIED



Hydronic
Air Handler



High-wall
HP Convector



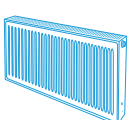
Floor-standing
HP Convector

HEATING COOLING

ENHANCED EFFICIENCY

Medium Water Temperature

USING (EXISTING) RADIATOR(S) OR BASEBOARD(S)



Radiator

Hydronic Baseboard /
Fin-tube

HEATING

STANDARD EFFICIENCY

High Water Temperature

Features and Benefits of *ALTHERMA*

Nomenclature

OUTDOOR UNIT

UP	R	A	036	DA	VK

- VK: Power supply 1 ph / 60 Hz / 230 V
- DA: Model Series
- 036: Capacity Class: 36,000 and 43,000 Btu/h
- A: Refrigerant R-32
- R: High water temperature (see operation range)
- UP: Hydrosplit outdoor unit pair reversible (heating/cooling)

INDOOR UNIT

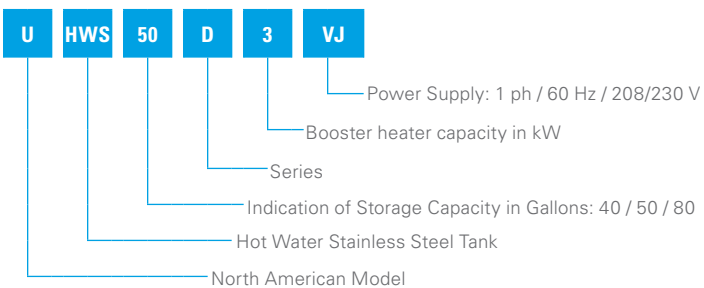
U	TB	X	040	EF	6	VJ

- VJ: Power supply 1 ph / 60 Hz / 208/230 V
- 6: Backup heater model 6 kW
- EF: Model Series
- 040: Capacity class 40,000 Btu/h
- X: Reversible (heating/cooling)
- TB: Wall-mounted hydrosplit unit
- U: North American model

Nomenclature

Optional Domestic Hot Water Tank (DHW)

UHWS40D3VJ
UHWS50D3VJ
UHWS80D3VJ

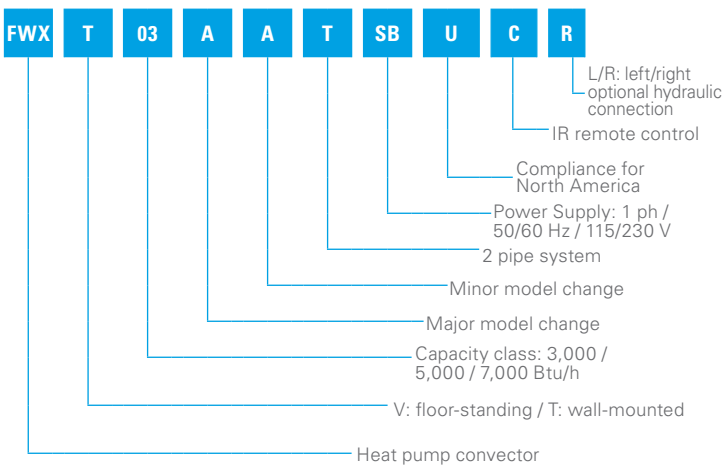


Volume	Height
40 gal (150 L)	39.4" (1,000 mm)
50 gal (200 L)	49.8" (1,264 mm)
80 gal (300 L)	68.7" (1,745 mm)

Nomenclature

Heat Pump Convectors

Floor-standing:	Wall-mounted:
FWXV03AATSBUR	FWXT03AATSBUCR
FWXV05AATSBUR	FWXT05AATSBUCR
FWXV07AATSBUR	FWXT07AATSBUCR
FWXV03AATSBUL	FWXT03AATSBUCL
FWXV05AATSBUL	FWXT05AATSBUCL
FWXV07AATSBUL	FWXT07AATSBUCL

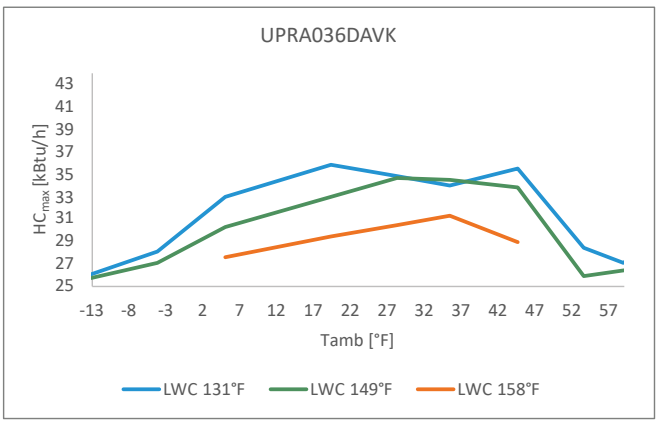


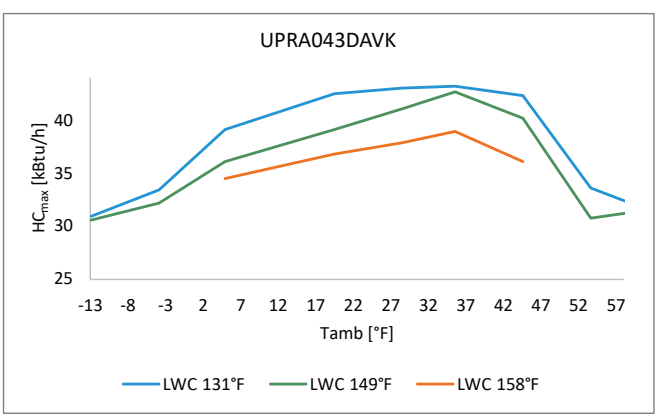
Floor-standing

Wall-mounted

Heating Capacities

Maximum Heating Capacity – Integrated Value



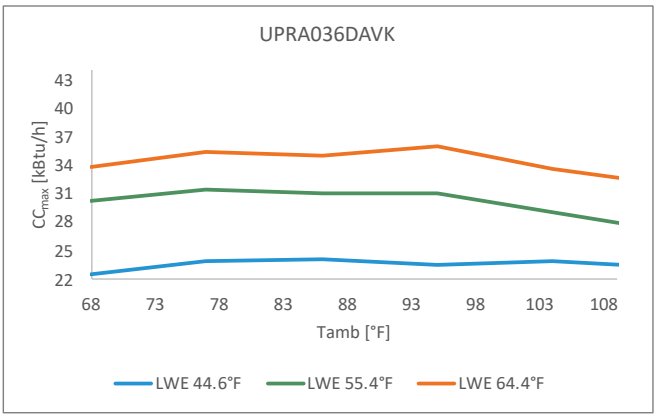


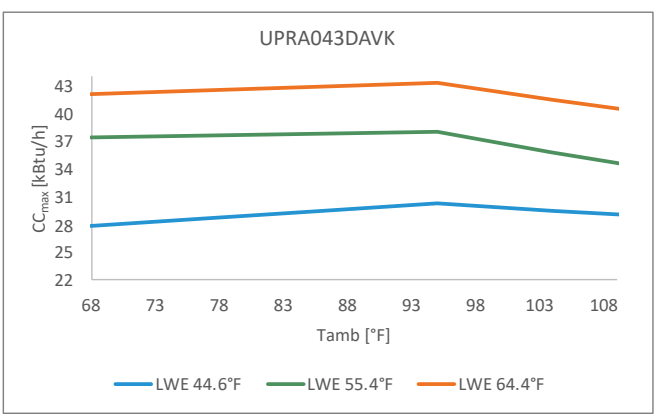
HC_{max} Heating capacity for maximum load, measured according to EN 14511 [kBtu/h]
LWC Leaving water condenser temperature [°F]
Tamb Ambient temperature [°F DB]

Note: The capacity and the power input are at maximum operation.
Capacity according to standard EN 14511 and valid for heated water range ΔT = 5.4~14.4°F.

Cooling Capacities

Maximum Cooling Capacity





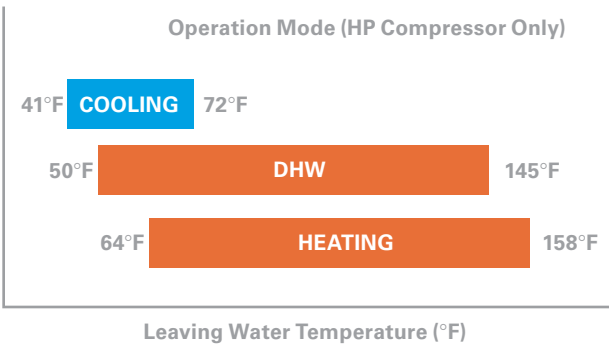
CC_{max} Cooling capacity at maximum operating frequency, measured according to EN 14511 [kBtu/h]

LWC Leaving water condenser temperature [°F]

Tamb Ambient temperature [°F DB]

Note: The capacity and the power input are at maximum operation.
Capacity according to standard EN 14511 and valid for chilled water range ΔT = 5.4~14.4°F.

Operation Range



Space Heating

» The air-to-water heat pump can produce a LWT of 158°F at 5°F ambient temperature and a LWT of 149°F at -18°F ambient temperature.

» With the integrated backup heater, the air-to-water heat pump can produce a LWT of 158°F at -18°F ambient temperature.

Domestic Hot Water (Optional)

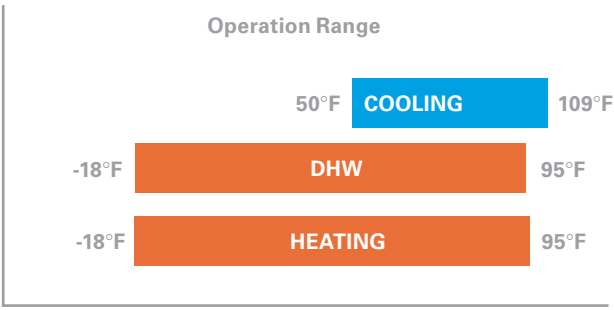
» The air-to-water heat pump can produce a LWT of up to 145°F at -18°F ambient temperature for DHW production.

» With the booster heater, the air-to-water heat pump can produce a LWT of up to 167°F at -18°F ambient temperature for DHW production.

Space Cooling

» The air-to-water heat pump can produce a LWT down to 41°F at 109°F ambient temperature.

Operation Range (cont.)



Space Heating

» The air-to-water heat pump can operate from -18°F to 95°F ambient temperature during space heating operation.

Domestic Hot Water (Optional)

» The air-to-water heat pump can operate from -18°F to 95°F ambient temperature during domestic hot water operation.

Space Cooling

» The air-to-water heat pump can operate from 50°F to 109°F ambient temperature during space cooling operation.

Emitters

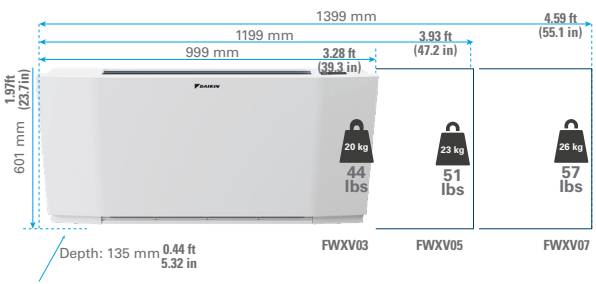
Heat Pump Convectors (Fan Coil Units)

» Daikin *ALTHERMA* HPC provides fan forced cooling and heating

Floor-standing (FWXV)

Controls

Type: Thermostat, Auto/manual fan speed, Touch panel



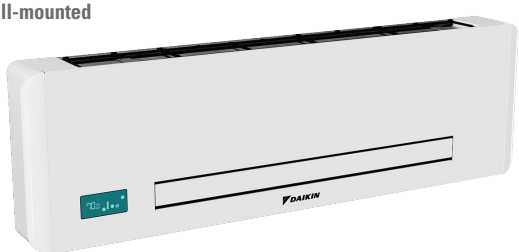
Heating/Cooling Capacities (Btu/h)			
Indoor unit Fan speed	**FWXV03**	**FWXV05**	**FWXV07**
Cooling capacity (45°F LWT) Minimum	2661	3753	3855
Medium	3753	5630	6756
Maximum	5527	9008	10202
Heating capacity (113°F LWT) Minimum	2968	3821	3787
Medium	4333	6517	7916
Maximum	6687	9758	11942

Features and Benefits of *ALTHERMA*

Emitters (cont.)

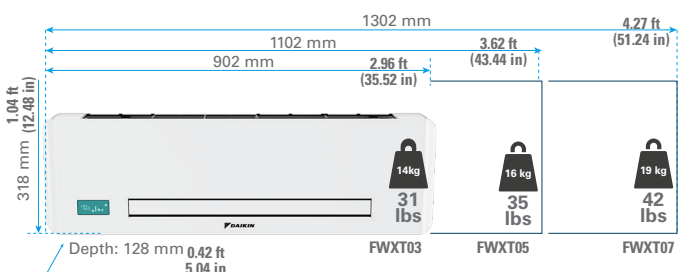
» Daikin *ALTHERMA* HPC provides fan forced cooling and heating

Wall-mounted



Controls

Type: Thermostat, Auto/manual fan speed, Infrared controller



Heating/Cooling Capacities (Btu/h			
Indoor unit Fan speed	**FWXT03**	**FWXT05**	**FWXT07**
Cooling capacity LWT 45F: Minimum	1671	2115	2388
Medium	3002	3685	4128
Maximum	4231	5493	6619
Heating capacity LWT 113F: Minimum	1877	2696	2866
Medium	3412	4641	5971
Maximum	5118	6858	8223

Daikin *ALTHERMA* HPC Accessories

Accessories consists of an automatic valve with thermo-electric head and a lock shield, fitted with micrometric adjustment, capable of balancing the system load losses. The kit contains the insulation to be mounted on the valve and on the lockshield.

» All Fan coils (HPC) will come with two Eurokonus adapters for field pipe connections.

Motorized 3-way diverter (bypass) valve with thermo-electric head for FWXV series: UK2VK1

Motorized 2-way diverter valve with thermo-electric head for FWXV series: UK2VK0

Daikin *ALTHERMA* HPC Accessories (cont.)

Accessories consists of an automatic valve with thermo-electric head and a lockshield, fitted with micrometric adjustment, capable of balancing the system load losses. The kit contains the insulation to be mounted on the valve and on the lockshield.

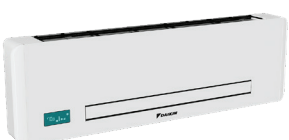
Motorized 2-way diverter valve with thermo-electric head for FWXT series: UKT2VK0

Motorized 3-way diverter (bypass) valve with thermo-electric head for FWXT series: UKT3VK1

Infrared Remote Controller

- » Remote
- » Fully Modulating
- » For Models FWXT-AATSBUCL
- » Comes with the high wall mounted indoor units

- » All Fan coils (HPC) will come with two Eurokonus adapters for field pipe connections.

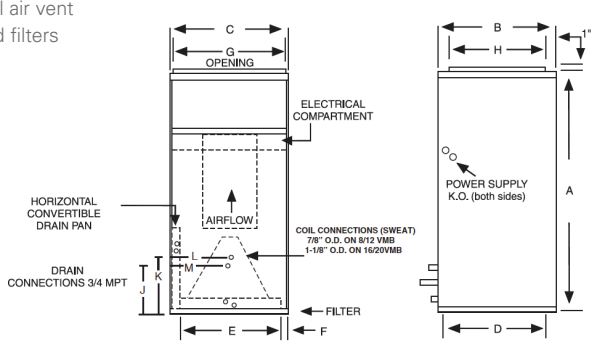


Features and Benefits of *ALTHERMA*

Hydronic Air Handling Unit (AHU)

Hydronic air handling units can be used in a variety of ways. Retrofit or new construction.

- Hydro-air or traditional forced air applications
- Fuel fired furnace/optional DHW replacement
- High efficiency AHU
- Engineered to operate efficiently in low temperature applications
- ECM motor
- Vertical/Horizontal drain pan (right-to-left and left-to-right airflow)
- Manual air vent
- Pleated filters



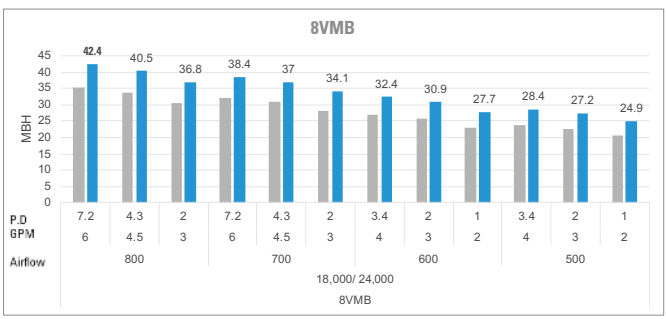
Physical Dimensions										
Unit Model	A	B	C	D	E	F	G	H	Coil Connection	Filter Size
8VMB	40	20	20	18½	16	2	18	16	⅞ swt	18x20x1
12VMB	42	23	20	21½	16	2	18	17	⅞ swt	20x22x1
16/20VMB	48	26	21¼	26¼	17¼	2	19¼	18	1⅛ swt	20x25x1

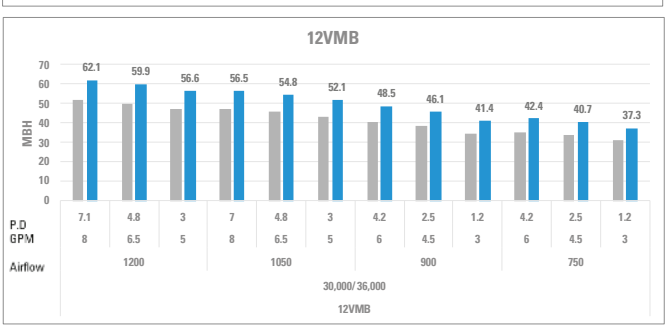
Electrical Data				
Unit Model	Motor HP (120vac)	Motor Amps	MCA	MOP
8VMB	⅓	4.8	6	15
12VMB	½	7.3	10	15
16VMB	¾	10.5	14	15
20VMB	1	11.5	15	15

Hydronic Air Handling Unit (AHU) (cont.)

Optimizing system performance is utilizing the low leaving water temperature (LWT). Select the AHU that will give the required airflow and BTUs for the needs of the space being serviced by the unit.

- » Size pumps and/or hydronic zones with pressure drop and flow in mind
- » MBH is based on airflow and waterflow
- » Pressure drop through the coil increases as GPM increases
- » Refer to pump manufacturer for the model pump curve to assure the pump is adequate for the application
- » Capacities shown (ex: 18000/24000) are nominal cooling capacities





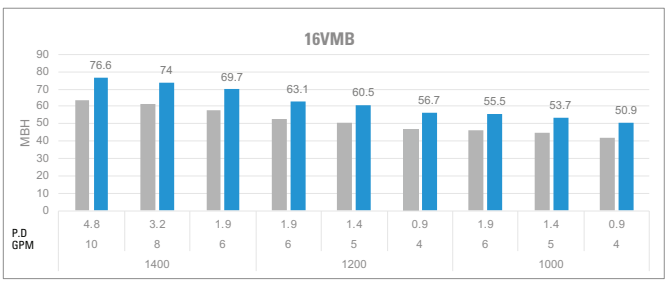
- VMB Series Heating Performance Data at 120°F Water Temperature
- VMB Series Heating Performance Data at 130°F Water Temperature

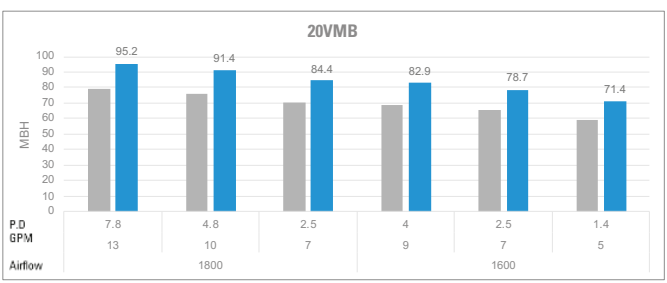
P.D. Pressure Drop in feet of water (head pressure)

Hydronic Air Handling Unit (AHU) (cont.)

Optimization of the AHU in combination with *ALTHERMA*

- 120°F-130°F charts showing the MBH gained with lower LWT temperatures which can increase efficiency when paired with the *ALTHERMA*.
- MBH changes as the water flow rate and air flow change
- As the GPM increases the pressure drop also increases
- To summarize: Design efficiencies are best found using the larger AHU with lower airflow (CFM) and lower GPM flow of water through the coil





- VMB Series Heating Performance Data at 120°F Water Temperature
- VMB Series Heating Performance Data at 130°F Water Temperature

P.D. Pressure Drop in feet of water (head pressure)

Hydronic Air Handling Unit (AHU) (cont.)

AHU and system performance is directly affected by multiple factors. Select the right size AHU for the application all while maintaining efficient water temperatures and flow making allowances for the pressure drop through the coil.

Air Handling Unit Cooling Performance

Unit Model	Nominal CFM	GPM	PD (ft of Water)	45°F Entering Water						42°F Entering Water					
				80°F DB/67°F WB Ent. Air			75°F DB/63°F WB Ent. Air			80°F DB/67°F WB Ent. Air			75°F DB/63°F WB Ent. Air		
				Total MBH	Sens MBH	Temp Rise	Total MBH	Sens MBH	Temp Rise	Total MBH	Sens MBH	Temp Rise	Total MBH	Sens MBH	Temp Rise
8VMB	600	3.0	2.5	19.0	13.8	12.7	14.5	12.1	9.7	20.7	14.4	13.8	15.8	12.6	10.5
		4.5	5.5	22.4	15.1	9.9	17.1	13.1	7.6	24.4	15.9	10.8	18.6	13.7	8.3
		6.0	9.5	24.4	15.9	8.2	18.7	13.7	6.2	26.6	16.8	8.9	20.3	14.4	6.8
	800	3.5	3.4	23.1	17.3	13.2	17.6	15.2	10.1	25.2	18.1	14.4	19.2	15.8	11.0
		5.0	6.7	26.9	18.7	10.7	20.5	16.3	8.2	29.3	19.6	11.7	22.4	17.1	8.9
		6.5	11	29.2	19.6	9.0	22.3	17.0	6.9	31.8	20.6	9.8	24.3	17.8	7.5
12VMB	1000	4.0	2.4	28.3	21.6	14.1	21.6	19.0	10.8	30.8	22.5	15.4	23.6	19.7	11.8
		6.0	4.8	33.9	23.7	11.3	25.9	20.6	8.6	36.9	24.8	12.3	28.2	21.6	9.4
		8.0	7.9	37.3	25	9.3	28.5	21.7	7.1	40.6	26.3	10.2	31	22.7	7.8
	1200	5.0	3.5	33.7	25.5	13.5	25.8	22.4	10.3	36.8	26.6	14.7	28.1	23.3	11.3
		6.5	5.5	38.0	27.1	11.7	29.1	23.7	8.9	41.5	28.4	12.8	31.7	24.7	9.7
		8.0	7.9	41.0	28.2	10.3	31.3	24.6	7.8	44.7	29.6	11.2	34.1	25.7	8.5
16VMB	1400	4.5	2	36.2	29.2	16.1	27.7	25.8	12.3	39.5	30.3	17.6	30.1	26.7	13.4
		6.0	3.3	42.4	31.4	14.1	32.4	27.6	10.8	46.2	32.8	15.4	35.3	28.7	11.8
		7.5	4.8	46.9	33.1	12.5	35.8	28.9	9.6	51.1	34.7	13.6	39	30.2	10.4
	1600	6.0	3.3	44.2	34.1	14.7	33.8	30.0	11.3	48.2	35.5	16.1	36.8	31.2	12.3
		8.0	5.4	51.0	36.6	12.7	38.9	32.0	9.7	55.5	38.3	13.9	42.4	33.4	10.6
		10.0	7.9	55.7	38.4	11.1	42.5	33.4	8.5	60.7	40.3	12.1	46.3	34.9	9.3
20VMB	1600	6.5	3.8	46.1	34.8	14.2	35.2	30.6	10.8	50.3	36.3	15.5	38.4	31.8	11.8
		8.5	6	52.3	37.1	12.3	39.9	32.4	9.4	57.0	38.8	13.4	43.5	33.8	10.2
		10.5	8.6	56.6	38.7	10.8	43.2	33.7	8.2	61.7	40.7	11.8	47.1	35.2	9.0
	2000	7.0	4.3	52.4	40.9	15.0	40	36.1	11.4	57.1	42.6	16.3	43.6	37.4	12.5
		10.0	7.9	61.7	44.3	12.3	12.3	47.1	9.4	67.3	46.4	13.5	51.4	40.5	10.3
		13.0	12.5	67.5	46.5	10.4	51.6	40.5	7.9	73.6	48.8	11.3	56.2	42.4	8.6

ALTHERMA and AHU System Design

Example of optimizing the sizing of the AHU for heating and cooling

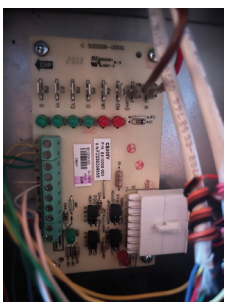
- Cooling load is 25 MBH total cooling
- Heating load calls for 44 MBH of heating
- Using the charts you will find the 12VMB will perform as needed.
- AHU will need 6.5 GPM, accounting for the pressure drop through the coil of 4.8 ft of water or 2.1 psi. (1PSI=2.31 ft of water) NOTE: The pressure drop when heating is different than in cooling. Piping and pump sizing should be checked for these factors. This is fixed for both the heating and the cooling loads.
- AHU airflow setting for heating would be at 1050 CFM (total heating is 45.6 MBH)
- AHU airflow for cooling would be set for 1000 CFM (total MBH is 25.9)
- Temperature from the *ALTHERMA* (LWT) would be set for 120°F for the heating season.
- Operating the AHU at 120°F would provide higher efficiency compared to a higher LWT.
- The LWT for the cooling season would be set for 45°F (75°F DB/63°F WB entering air)
- These modest temperatures and setpoints will increase the efficiency of the *ALTHERMA* system.
- Temperatures and flow rates too can be adjusted for comfort of the end user and optimization of the *ALTHERMA* system.
- Using a 12VMB will perform for the load. Key factors when selecting a 12VMB is the GPM and pressure drops across the coils may require secondary pumping to account for the increase in waterflow.
- Be sure to verify pump operation and pipe restriction considerations.

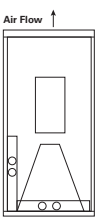
Designing a successful system

Establish Heat Load	Read charts and establish what flow rates will work for the design.
» Cooling load is 25 MBTU total cooling » Heating load calls for 44 MBTU of heating	» Flow Rate 6.5 GPM at 4.8ft of water » Ensure piping and pumps are designed to support this
Match flow rate with AHU Airflow to satisfy heat load	**Commission *ALTHERMA* Setpoints for AHU**
» Cooling 1000 CFM and 6.5 GPM gives 25.9 MBH at 45°F cooling » Heating 1050 CFM and 6.5G PM gives 45.6 MBH at 120°F	» 120°F heating » 45°F cooling

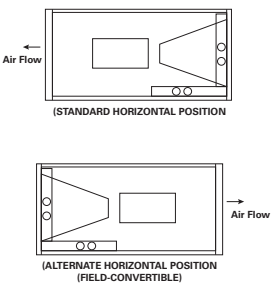
ALTHERMA and AHU System Design (cont.)

The airflow selection is another important factor in optimization of the system. The airflow working along with the water flow rate and LWT gives the performance of the complete system. Be sure to select the right combination to obtain efficient performance.





3-WAY AIRFLOW



On the AHU control PCB make the selection for your system requirements.

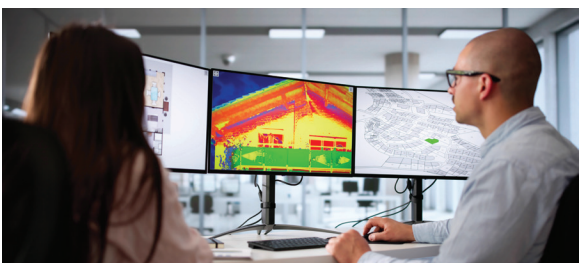
Air Flow Data									
Model	Operating Mode	Control Board Selection Taps							
		Cool CFM				Heat CFM			
		A	B	C	D	A	B	C	D
8VMB	Cooling or Heating Thermostat Signal					800	700	600	500
	Continuous Blower	400	350	350	250				
12VMB	Cooling or Heating Thermostat Signal					1200	1050	900	750
	Continuous Blower	600	525	450	375				
16VMB	Cooling or Heating Thermostat Signal					1600	1400	1200	1000
	Continuous Blower	800	700	600	500				
20VMB	Cooling or Heating Thermostat Signal					1825	1200	1600	1400
	Continuous Blower	900	850	800	700				

SYSTEM SELECTION

System Selection

System selection has a series of steps to obtain optimal performance and versatility of the *ALTHERMA* system.

1. Perform a room by room load calculation using Manual-J as recommended by ACCA (Air Conditioning Contractors of America)
2. Educate the end user on the versatility and operation of the *ALTHERMA* system offering options gained with the use of hydronics for both heating and cooling.
3. Decide what kind of system the end user desires considering the interview and comfort of the end user.
4. Decide the size and type of piping configuration will be necessary for the optimal performance of the *ALTHERMA* system.
5. Verify site considerations for design and layout



Heat loss calculation

» Know geographic location of site
  – Geographical location gives the design temperature of the actual site. Some areas can have a large difference in design temperatures within short distances. Some local codes will desire more strict design temperatures than those pre-loaded in some Manual-J programs
» Verify insulation values. (sometimes age of building will help negotiate this task)
» Wall type. Framing type with what exterior and interior finishes that may increase or decrease insulation properties.
» Number of occupants
» Verify inside design temperatures as the end user desires
» Using measuring tools, measure all rooms walls and ceiling height
» Windows and door sizes
» Verify window insulation. Sometimes this can be determined by understanding the age of the windows.
» Record floor and ceiling area size and what type of ceiling and floor
» Is the ceiling over a second floor or attic. What is the insulation.
» Is the floor concrete slab, basement or crawl space.
» Note conditions underfloor and above ceiling
» Enter recorded information into an acceptable heat load calculating program

System Selection

End User Interview Education

To properly size and ensure comfort to the end user asking the right questions is key to ensure comfort.

- Talk to the end user and find out what temperatures they are comfortable at.
- Is anyone sensitive to humidity or moving air?
- How many members of the house?
- Are they happy with their current system, why?
- Does their current system keep all areas warm and cool enough in each season throughout the year?
- Any damp areas?
- What type of heating system is preferred? Some have never been asked this question!
- Tell them about all the possibilities with using a hydronic system; radiant, warm air, baseboard, fan coil, panel, etc.
- Would they like to have certain areas controlled by their own thermostat? Explain zoning options like breaking the system up by areas, rooms, floors, other?
- How much domestic hot water do they use?
- Have they run out, when?
- Do they have large tubs?
- How many bathrooms?
- Do they like to entertain large groups?
- Start keeping track of job information using a product check list.

Domestic Hot Water Tank Sizing

Many consider water to be hot when its temperature is 105°F or higher. Therefore, the DHW consumption is always expressed as equivalent hot water volume at 105°F. However, you can set the DHW tank temperature at a higher temperature (example: 130°F which is a scalding temperature), then mix with cold water (example: 59°F) through a mixing valve rated for residential DHW purposes to increase capacity.

Selecting the volume and desired temperature for the DHW tank consists of:

» Determining the DHW consumption (equivalent hot water volume at 105°F)

» Determining the volume and desired temperature for the DHW tank.

To properly size an optional domestic hot water tank, a proper understanding of the end user's needs is imperative. Ask some simple questions to put together a domestic hot water system.

Question	Typical water volume
How many showers are needed per day?	1 shower = 10 minutes x 2.5 GPM flow rate of shower head = 25 gallons
How many baths are needed per day?	This number can vary range is 30-60 gallons
How much water for kitchen sink usage?	Average sink aerator regulates water to a flow of 1.5 GPM 2 minutes of wash would result in 3 gallons of water

Determining the volume and desired temperature of the DHW tank	
Formula	**Example**
V1=V2+V2x(T2 – 105)/(105 – T1) V1 = 50 + 50x(130 –105)/(105 – 55) V1 = 75 gallons	If: ▪ V2=50 gallon ▪ T2=130°F ▪ T1=55°F Then V1=75 gallons
V2 = V1x(105-T1)/(T2-T1) V2 = 125x(105-55)/(130-55) V2 = 83 gallons	If: ▪ V1=125 gallons ▪ T2=130°F ▪ T1=55°F Then V2=83 gallons

V1 = DHW consumption (equivalent hot water volume at 105°F)
V2 = Required DHW tank volume if only heated once
T2 = DHW tank temperature
T1 = Cold water inlet temperature

AlthermaXpress

Fast-n-easy sizing and configuration for Daikin *ALTHERMA* systems.

What it is

AlthermaXpress is a web-based tool that helps installers, dealers and consultants select the right Daikin *ALTHERMA* system in just a few steps.

What it does

This tool allows the user to quickly select the right combination of outdoor & indoor units along with the heat emitters based on specific heating or cooling requirements, climate conditions and design parameters. This tool also generates technical documentation and performance data for use in proposals or installation planning. Once the equipment is selected, a quote can also be generated via Daikin City.

Why use it

1. Ensure accurate selections based on real project needs
2. Generate submittal data for project planning
3. Save time with quick and reliable system sizing

Project Settings

Enter the project name and location. Once the location is specified, the tool automatically applies the corresponding ambient design temperatures. Optional fields, such as client name and project reference, can also be included.

Design Solution

Define the application & construction type by entering heating and cooling loads, flow temperatures, equipment selection, and heat emitter configuration.

Product Overview

View a complete summary of the selected equipment, including heat emitters. A system performance graph is also provided to verify that the air-to-water heat pump can meet the required loads. A technical report can be generated at this stage.

Get started today

Log in with your Daikin City account at:
https://althermaxpress.daikincity.com/

Controls

The *ALTHERMA* system is configured using the MMI (Man-Machine Interface) controller. This controller can handle a multitude of variations in hydronics.

- Easy navigation and understanding
- Optimize the system in 9 easy steps
- Configure the system to operate with a maximum heating LWT of 158°F or the lowest LWT that the system will need to provide comfort and efficiency for the system design.
- Remotely Capable using the *SkyportHome* App.
- Dual zoning control with two separate LWT settings
- Easily select the type of emitters for the system design. UF heating, Fan coil, Radiator, DHW tank
- Outdoor Reset (weather dependent) capable for system efficiency

The system produced heat is calculated internally based on setting in the MMI controller:

- The leaving water temperature
- The flow rate
- Power consumption of the booster heater (if applicable) in the domestic water tank

For system setup and configuration:

- No additional equipment needed
- Only in case a booster heater is present in the system, measure its capacity (resistance measurement) and set the capacity via the user interface.
- Example: If you measure a booster heater resistance of 17.1Ω, the capacity of the heater at 230 V is 3100 W.

Controls (cont.)

Calculating the consumed energy

» The consumed energy is calculated internally based on:
  – The actual power input of the outdoor unit
  – The set capacity of the backup heater and booster heater (if applicable)
  – The voltage
» Setup and configuration: To get accurate energy data, measure the capacity
  – (resistance measurement) and set the capacity via the user interface for:
    – The backup heater (step 1 and step 2) (if applicable)
    – The booster heater

Thermostat - Daikin D2271 Connected Thermostat

» Link to the *SkyportHome* App.
» Standard 24vac thermostat connections
» 2 heat and 2 cool capabilities

D-checker tool compatible for diagnostics

» Plugs into the hydrobox PCB on terminal X10

FOR ADDITIONAL RESOURCES AND INSTRUCTIONAL VIDEOS, SCAN CODE OR VISIT:
WWW.DAIKINCOMFORT.COM

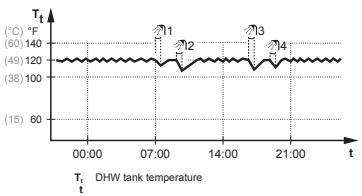
Controls (cont.)

Domestic Hot Water control

When configured with the *ALTHERMA* system, selecting how the DHW will be controlled is a vital part of the interview process. Being able to answer the end users DHW consumption times as well as when and how beneficial producing DHW during things like off peak hours or cooler parts of the day. Maybe when thermostats are setback for night time or work hours. Every end user will have different requirements and needs.

Reheat Mode

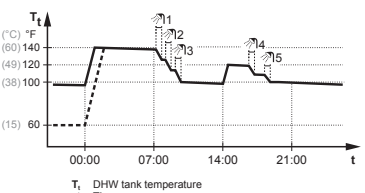
In reheat mode, the DHW tank continuously heats up to the temperature shown on the home screen (example: 120°F (49°C)) when the temperature drops below the differential value.



T_t DHW tank temperature
t

Schedule Mode

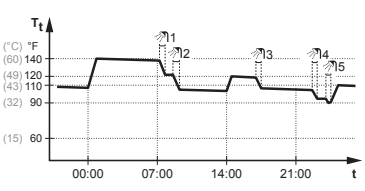
In scheduled mode, the DHW tank produces hot water corresponding to a schedule. Based on the end users schedule, commission a schedule that best fits the need of the end user while still providing comfort and reliability. These are questions that should be asked during an end user interview.



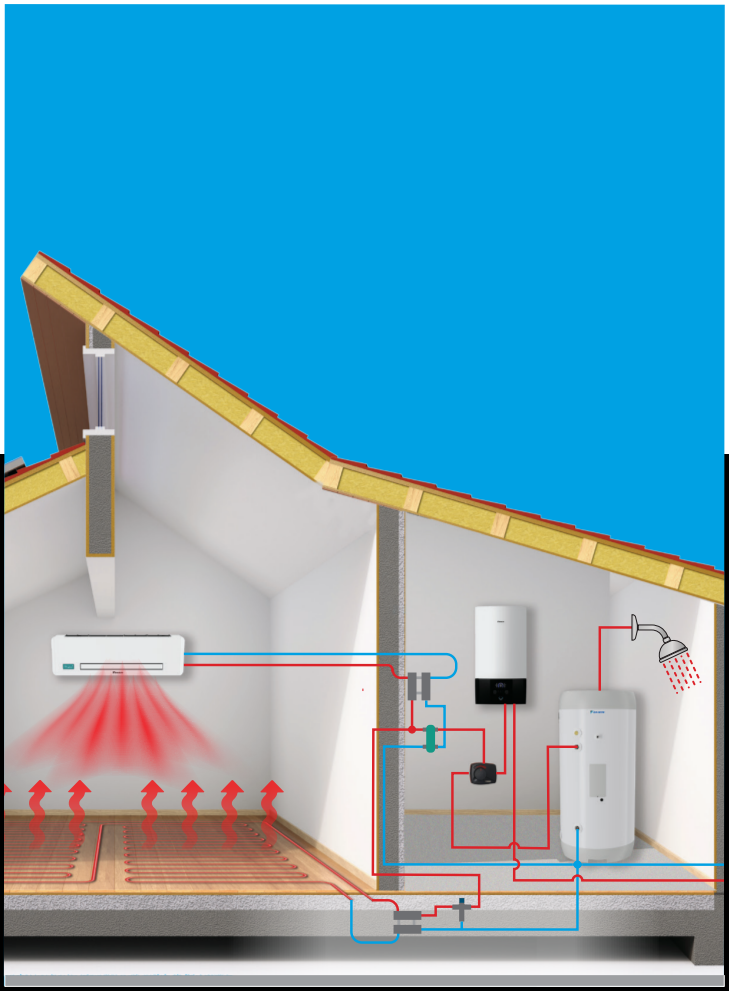
T_t DHW tank temperature
t Time

Schedule + Reheat Mode

In schedule + reheat mode, the domestic hot water control is the same as in scheduled mode. However, when the DHW tank temperature drops below a preset differential (=reheat tank temperature – differential value; example: 90°F (32°C)), the DHW tank heats up until it reaches the reheat set point (example: 110°F (45°C)). This ensures that hot water is always available.



T_t Domestic hot water tank temperature
t Time



APPLICATION EXAMPLES

Application Examples

Versatility of Hydronics

The versatility of hydronics is the answer to endless HVAC needs. Whether the job calls for a boiler or furnace replacement, both can be achieved with the additional option of securing domestic hot water needs.

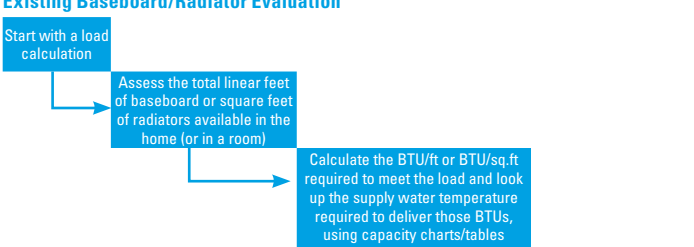
Using *ALTHERMA* for new construction is like painting a blank canvas. Various types of emitters and radiant heating as well as cooling whether with HPC, AHUs or even used in heat only situations if desired.

Here is a list of benefits while using *ALTHERMA* and application examples of its versatility.

Application Example	Options	HEATING	COOLING	HOT WATER
(Combi) Boiler Replacement	Use existing baseboard/radiators	YES	NO	YES
	Use existing baseboard/radiators + add heat pump convectors (replacing window or mini-split units)	YES	YES	YES
	Use existing in-floor/underfloor radiant loop	YES	NO	YES
	Use existing in-floor/under-floor radiant loop + add heat pump convectors (replacing window or mini-split units)	YES	YES	YES
	Replace existing hydronic loop with heat pump convectors	YES	YES	YES
Gas or oil furnace/ optional gas DHW replacement	Replace gas or oil furnace with hydronic air handler, remove AC unit and replace DHW tank	YES	YES	YES
New construction	In-floor radiant loop, heat pump convectors or combination of the two to include DHW	YES	?	YES

? – This option is dependent on the selection in design
NOTE: The hot water capability is optional.

Existing Baseboard/Radiator Evaluation



Tips from the field:

- Read the manuals associated with your project
- Get *ALTHERMA* training. This is not a basic boiler change out or installation.
- Be sure to have a clear plan and draw out the project piping prior to installation.
- Do a proper site assessment

Application Examples

Concept Drawings

Concept drawings for applications on boiler retrofits. Drawings are a baseline for system configuration. Be sure to use good hydronic heating and cooling practices when installing an *ALTHERMA* system.

» Things to consider
- Baseboard and radiator ratings based on leaving water temps that increase efficiencies (110°F-140°F)
  - Baseboard and radiators are typically high temperature emitters. For optimization of the *ALTHERMA* system it is best practiced using lower LWT and more radiation as well as balancing valves (circuit setters to ensure performance) Check with baseboard/radiant panel manufacturer for ratings of their specific equipment.
- Freeze protection devices over glycol to increase efficiencies (refer to freeze protection)

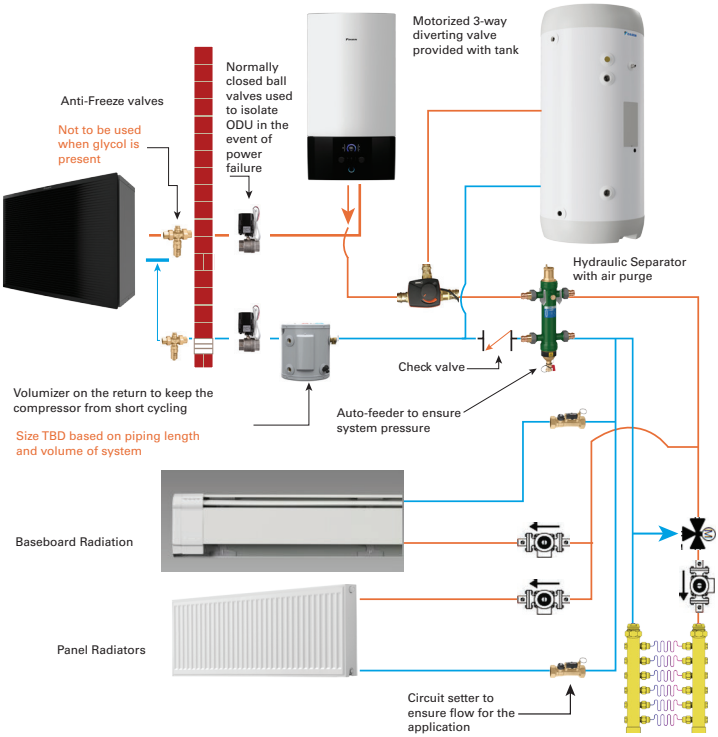
Concept drawings for furnace replacement

» Things to consider
- Refer to BTU outputs and flow rates from the AHU at lower LWT increase efficiencies (refer to AHU tables)
- Freeze protection devices over glycol to increase efficiencies
- Internal hydrobox pump sized for heating and cooling load
- Refer to AHU capacities at certain LWT and water flow rates
- Optimize capacities with the MMI control settings using the outdoor reset (weather dependent) control setpoints
- Ensure good purge point for system air purging

Application Examples (cont.)

Concept Drawings (cont.)

Boiler Replacement and DHW to Existing Baseboard/Radiators and /or Underfloor Radiant heating Only



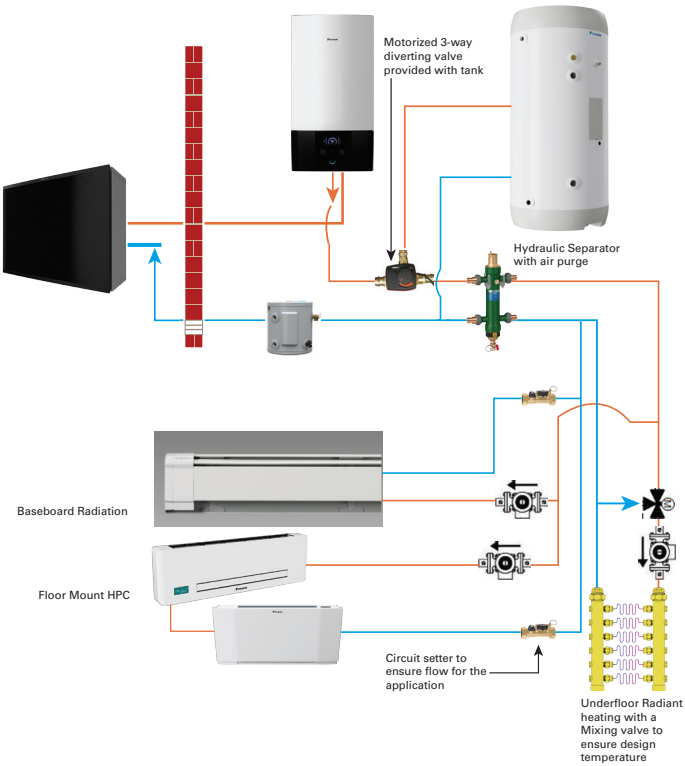
Be sure to verify with baseboard manufacturer ratings

Water Flow	Hot Water Ratings – BTU/ft at 65°F entering air				
	110°F	120°F	130°F	140°F	180°F
1 GPM	160	210	260	320	580
4 GPM	160	210	270	340	610

Application Examples (cont.)

Concept Drawings (cont.)

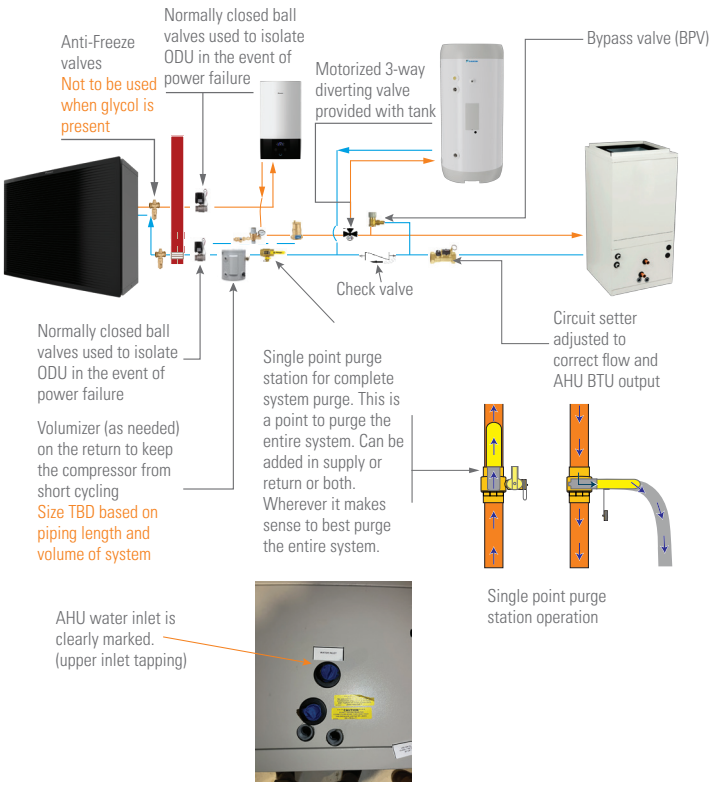
Boiler Replacement with Existing Baseboard/Radiators adding Heat Pump Convectors (HPC)



Application Examples (cont.)

Concept Drawings (cont.)

Furnace/DHW Retrofit



SITE CONSIDERATIONS

Water Volume and Piping Considerations

The 3-way valve diverts the hydronic water flow from the heating/cooling piping to the DHW piping to handle the demand requested. Proper installation considerations need to be adhered when integrating into the piping. Be sure to follow the installation manual before and during the installation process. The inlet piping from the hydrobox is NEVER to be piped in the branch port of the valve.

- The installation needs to be made in such a way that a minimum water volume of 5.3 gal (20 liters) is always available in the space heating/cooling loop of the unit, even when the available volume towards the unit is reduced because of closure of valves (heat emitters, thermostatic valves, etc.) in the space heating/cooling circuit. The internal water volume of the outdoor unit and indoor unit is NOT considered for this minimum water volume
- Differential bypass valve adjustment is necessary for minimum flow when emitters are closed during defrost/backup heater operation.
- Minimum flow rate with space heating emitters closed is +0.53 GPM (2 l/min) Example: 5.8 GPM minimum flow required + 0.53 GPM for differential bypass = 6.33 GPM minimum with space heating emitters closed. (22 l/min + 2 l/min = 24 l/min total)
- If a bypass is in place eliminating the need for the differential bypass valve, minimum flow must still be maintained when space heating emitters are closed.
- **The *ALTHERMA* system has a minimum volume of water necessary to ensure the compressor does not short cycle. If the system is found to be short of volume, then a volumizer will need to be sized.**
  - Sizing the volumizer requires figuring the volume of the system and comparing the minimum of 5.3 gal (20 liters) volume and comparing that to the figured volume. The difference is the minimum size volumizer necessary.
  - To figure the volume of the piping:
    - Measure the length of piping between the hydrobox and the ODU
    - The standard piping connections are 1" which contains 0.0408 gallons per foot of pipe. Refer to the table for volume of water per foot for the size pipe used.

Pipe Size	Gallons/ft
½"	0.01
¾"	0.023
1"	0.041
1-¼"	0.064
1-½"	0.092
2"	0.163

Site Considerations

Water Volume and Piping Considerations (cont.)

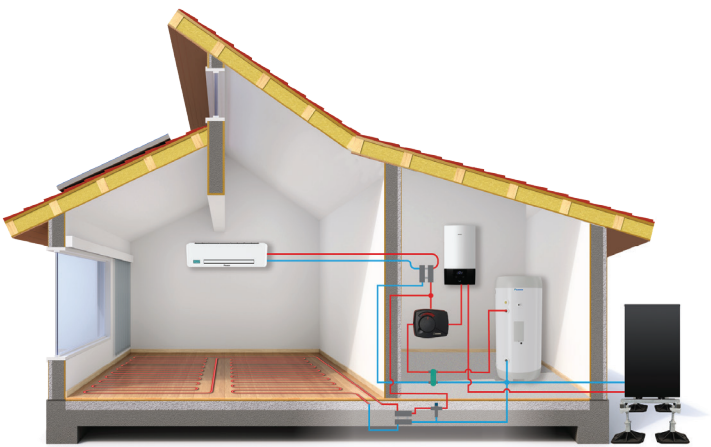
Expansion tank/vessel sizing and volume

To check the water volume and flow rate, the indoor unit has an expansion vessel of 2.64 gallons (10 liters) with a factory-set pre-pressure of 14.5 psi (1 bar)

To make sure that the unit operates properly:

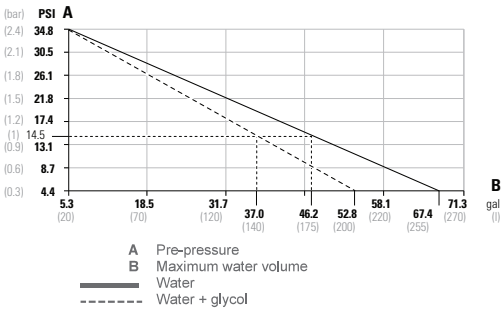
» You MUST check the minimum and maximum water volume.

» You might need to adjust the pre-pressure of the expansion vessel



Maximum water volume and expansion vessel pre-pressure

The maximum water volume depends on whether glycol is added to the water circuit. Use the following graph to determine the maximum water volume for the calculated pre-pressure.



(a) is the highpoint difference (ft) between the highest point of the water circuit and the indoor unit. If the indoor unit is at the highest of the installation, the installation height is 0 ft.

Installation height difference(a)	Water Volume	
	≤ 50.2 gal	>50.2 gal
≤ 23 ft	No pre-pressure adjustment is required.	**Do the following:** » Decrease the pre-pressure according to the required installation height difference. The pre pressure should decrease by 1.45 psi (0.1 bar) for each 3 ft (1 m) below 23 ft (7 m). » Check if the water volume does NOT exceed the maximum allowed water volume.
> 23 ft	**Do the following:** » Increase the pre-pressure according to the required installation height difference. The pre-pressure should increase by 1.45 psi (0.1 bar) for each 3 ft (1 m) above 23 ft (7 m). » Check if the water volume does NOT exceed the maximum allowed water volume.	The expansion vessel of the indoor unit is too small for the installation. In this case, it is recommended to install an extra vessel outside the unit.

Maximum water volume and expansion vessel pre-pressure (cont.)

Example:

The indoor unit is installed at the highest point in the water circuit. The total water volume in the water circuit is 66 gallons.

Actions:

» Because the total water volume (66 gallons) is more than the default water volume (50.2 gallons), the pre-pressure must be decreased.

» The required pre-pressure is:

– Pg = (0.3+(H/10)) bar = (0.3+(0/10)) bar = 0.3 bar

– The corresponding maximum water volume at 0.3 bar is 67.4 gallons. (See the graph in "Maximum water volume").

» Because 66 gallons is lower than 67.4 gallons, the expansion vessel is appropriate for the installation.

Heating Only Convectors

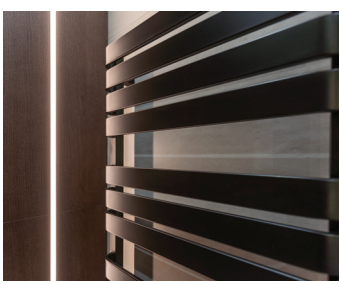
- **Types of convectors**
  - **Radiant Under Floor heating**
    - Importance of mixing valves to ensure proper design temps (typical temperature are between 85°F-125°F depending upon the type of underfloor radiant heating design)
    - Use the MMI to configure the zone for under-floor heating for best use of underfloor heating

Wall mount radiant convectors

- Refer to manufacturer for sizing based on maximum LWT of 158°F
- NOTE: Size the convector to the lowest LWT for maximum efficiency that fits the design of the system

Baseboard radiation

- Sizing varies based on manufacturers performance
- Use high temp zone wiring terminals
- Understanding flow rates and how they affect the heating capacities
- Use of shut-off valves to isolate chilled water system from heating only system control valves



Sectional Radiator Sizing and Optimizing

The end user may want to re-use the existing radiators to keep the old charm this will require some math. **Notice these types of radiators have a large volume of water and may cause the *ALTHERMA* to lose significant efficiency. It is not advised to use these types of radiators as they will not perform as originally intended.**

Hydrobox Circulating Pump

Inside the hydrobox is a variable speed ECM pump is controlled by ΔT capable of a maximum of 14.5 GPM at 5 feet of head.

» **What does this mean?**
  – All pumps have performance criteria rating. This means that the pump will flow a given amount of water/liquid with a certain amount of back pressure known as feet of head in many cases. Each 2.31 feet of head is equivalent to 1psi pressure drop.
  – The internal pump moves at a maximum rate of 14.5 GPM at 5 ft of head. Or 14.5 GPM with 2.2 psi back pressure in the system.

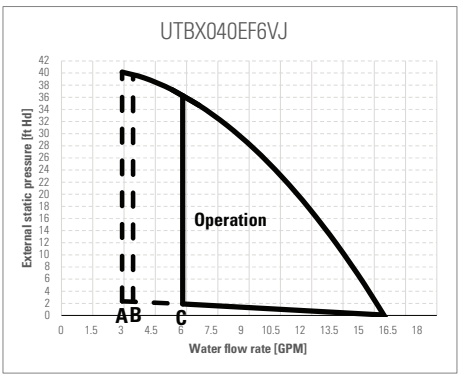
» **Why does this matter?**
  – When piping a system careful considerations need to be made to account for the proper amount of flow to heat or cool all while being mindful of the minimum required flow rate though the *ALTHERMA* system to maintain proper performance. The flow rate is measured and reports to the MMI controller providing a read-out on the controller.
    – 5.8 GPM for normal operation
    – 7.4 GPM during DHW production

» **Will a secondary pump be necessary?**
  – If the system has a significant pressure drop in the system exceeding the maximum head pressure a secondary piping system will need to be configured. Be sure to use a secondary pump rated for chilled water systems.

» **How does Glycol effect flow rates?**
  – Glycol at heating temperatures has minimal effects to the flow rate.
  – Glycol in cooling drastically increases head pressure.

Hydrobox Circulating Pump (cont.)

Pump curve of internal hydrobox pump



A. Minimum water flow rate during normal operation

B. Minimum water flow rate during backup heater operation

C. Minimum water flow rate during defrost operation

Considerations using pump curves

- Calculate water flow for load
- Friction loss using manufacturers pressure drop information plus added piping and fittings and where they fit in while designing
- Hydraulic separation
- Emitter flow requirements for optimal performance

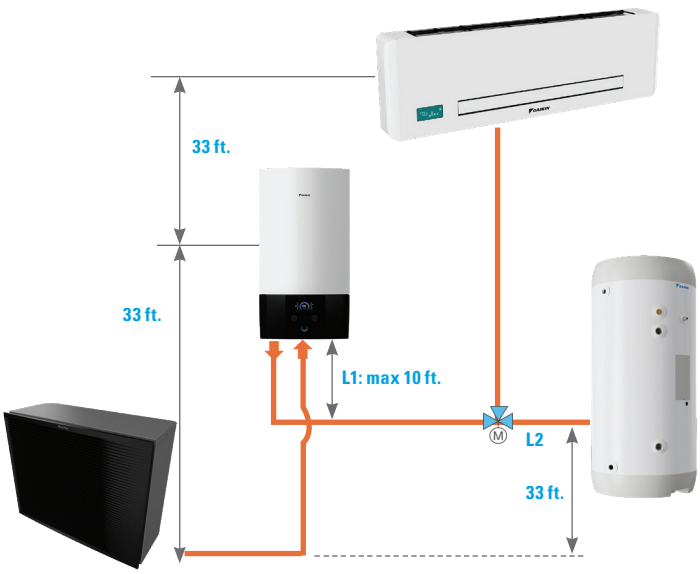
Site Considerations

Piping Layout Guidelines

» Maximum distance between indoor unit and domestic hot water tank: L1 + L2 ≤ 33 ft

» Maximum distance between indoor unit and 3-way valve (for installations with domestic hot water tank): L1: 10 ft

Height Limitations



Specialized Hydronic and DHW Considerations

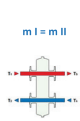
Hydronics allows a unique sense of versatility, although, with this versatility precautions and considerations need to be addressed.

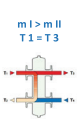
» **Mixing valves**
  – Ensure public safety when used in a DHW situation
    – Many times, mixing valves will be used to increase a DHW load by using higher tank temperatures but unsafe for DHW purposes. This is when it is required to have a mixing valve to maintain a safe temperature for use in a domestic situation. **Use a mixing valve rated for domestic purposes.**
  – Ensures radiant heating performance
    – Under-floor heating (radiant heat) typically will use a temperature less than most heating purposes require. Using a mixing valve ensures a consistent temperature per design.
    – Some radiant systems use a weather dependent control that operate independently for the radiant temperature needs.
    – Radiant systems are specifically designed systems allowing for the efficient use of the *ALTHERMA* system.

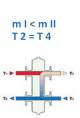
Hydraulic Separation and *ALTHERMA* Hydrobox

» The Hydrobox uses a variable speed ECM pump controlled by ΔT.
» As the ΔT lessens the pump speed decreases yet the pumps for the secondary loop side is maintained assuring proper heat transfer.
» This will cause a pressure differential
» Hydraulic separation separates the two different pressure zones
» Allowing both primary and secondary to be independent of each other
» As secondary pumps or zones satisfy the flow through the hydraulic separator changes drawing less from the primary side and the ECM pump slows down due to the lowered ΔT creating less energy exchange inside the hydraulic separator.
» The hydraulic separator is the point of zero pressure change and is the proper place to install an auto feeder

NOTICE: When circulation in each or certain space heating loops is controlled by remotely controlled valves, it is important that the minimum flow rate is guaranteed, even if all valves are closed. In case the minimum flow rate cannot be reached, a flow error 7H will be generated (no heating or operation).







Site Considerations

Water Quality

Ensure water quality complies with the following water quality requirements:

- The Product has been installed by a professional installer, in accordance with the instructions in the installation manual and all relevant Codes of Practice and Regulations in force at the time of installation.
- The Product has not been modified in any way, tampered with or subjected to misuse and no factory fitted parts have been removed for unauthorized repair or replacement.
- The Product has only been connected to a domestic mains water supply in compliance with Environmental Protection Agency (EPA). The water should not be aggressive, i.e. the water chemistry shall comply with the following:
  - Chloride < 250 mg / L
  - Total Dissolved Solids (TDS): <500 ppm
  - 6.0 < pH level < 9.5
- The immersion heater has not been exposed to hardness levels exceeding 12 grains per gallon (200mg/L) for residential use and 7 grains per gallon (120mg/L) for commercial use. A water softener is recommended in such cases.
- Any disinfection has been carried out without affecting the Product in any way whatsoever. The Product shall be isolated from any system chlorination. Service and/or repair shall be done according to the installation manual and all relevant codes of practice. Any replacement parts used shall be designated by the manufacturer.
- Any third-party costs associated with any claim must be authorized in advance by Daikin in writing. The purchase invoice and/or installation invoice, a water sample as well as the defective product is made available to Daikin upon request.
- Unit is certified for indoor use only. Do not install outdoors.
- Failure to follow these instructions and conditions may result in product failure, and water escaping from the Product.

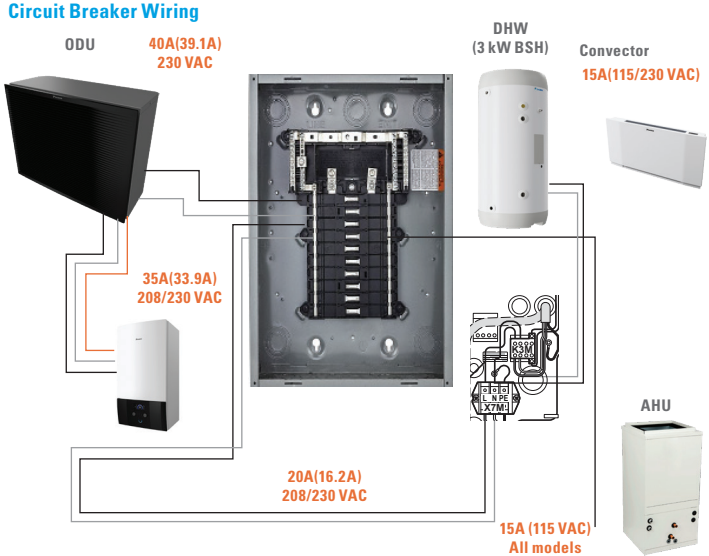
Site Considerations

Electrical Considerations

» The *ALTHERMA* will require some electrical considerations to accommodate the electrification of a home. This is a visual of needs for the *ALTHERMA* to function as designed.

For visual purposes only

Circuit Breaker Wiring



Surge Protection

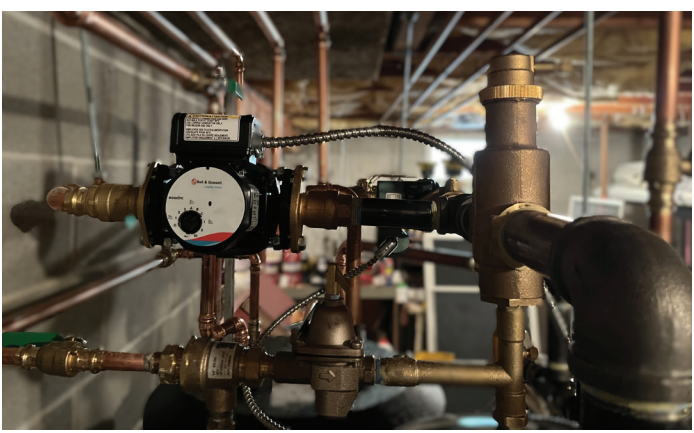
Just as all Daikin inverter systems it is recommended to protect the HVAC investment with surge protection and voltage monitoring. At minimum use a surge protector.

Site Considerations

Hydronic Piping

Water Distribution

- Design the water distribution system for types of convectors, underfloor heating, fan coil units and/or water heating needs.
- Pressure drops measured in feet of head/PSI (2.31 feet of head per 1 PSI) be sure to know what system requires.
- Know what the internal pump needs are and what it will do (see hydrobox circulation pump)
  - Make accommodations for secondary pumps if necessary and/or bypasses.
  - Use secondary pumps rated for chilled water.
- Water treatment (refer to water quality)
- This is not a boiler. Reading the manuals will be necessary
  - The outdoor unit
  - Hydrobox
  - DHW tank
  - Convectors



Hydronic Piping (cont.)

Hydronic Piping Design

- Complete load calculations
- Calculate the required waterflow using sensible heat formula:

GPM = Q ÷ (500 x ΔT) Q = BTU/H

1 GPM = 10MBTUH at 20ΔT most common

- Know the equivalent pipe lengths to include fittings friction loss of piping.
- Refer to piping/tubing manufacturer. Chart for reference only
- Size the terminal units (convectors) for each zone/room
- Know the friction loss of the units (see technical data of terminal units being used)
- Verify needs and select necessary piping
- Establish the piping configuration (series, primary secondary etc.)
- Verify pump specs and selection for the application. Pumps need to be rated for chilled water.
- NOTE: When using PEX tubing it must be rated for hydronic systems.

Tubing Size	Minimum Flo Rate (GPM)	Maximum Flow Rate (GPM)
½" copper	1.6	3.2
¾" copper	3.2	6.5
1" copper	5.5	10.9
½" pex	1.2	2.3
¾" pex	2.3	4.6
1" pex	3.8	7.5

Site Considerations

Freeze Protection

- » Water has a better performance over Glycol
- » Water has less concerns of corrosion over Glycol
- » Water requires little to no maintenance
- » Glycol will reduce energy efficiency

NOTICE

If glycol is added to the water circuit, and temperature of the water circuit is low, the flow rate will NOT be displayed on the user interface. In this case, the minimum flow rate can be checked by way of the pump test (be sure the user interface does NOT display error 7H).

Built-in software protection

- √ To protect piping
- – Water circulation via pump
- – Integrated BUH / Heater tapes
- √ To protect ODU
- – Bottom plate
- – Double hot gas bypass

Anti-freeze valve option:

- √ Only when no glycol is used
- √ Offers full system protection in case of power cut or pump break down
- √ Prevents ice forming by draining water from the system
- √ Prevents any damage to unit and pipes when temperature drops < 37°F (3°C) +/- 1°F (C)

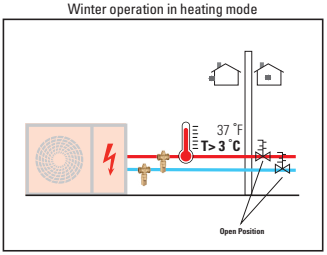
Freeze Protection (cont.)

1" Propress Copper Type L 134 equivalent FT Water @ 45F 6.5 GPM	
Velocity	2.5ft/second
Pressure Drop	1.9psi
Head Loss	4.4ft

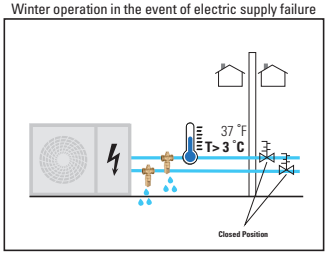
1" Propress Copper Type L 134 equivalent FT, 30% Propylene Glycol @ 45F 6.5 GPM	
Velocity	2.5ft/second
Pressure Drop	2.5psi
Head Loss	6.4ft

» Comparison based Copper Propress 100 feet of 1" copper L tubing
10 Elbows 2 Tees off branch

Winter operation in heating mode



Winter operation in the event of electric supply failure



Site Considerations

Insulation of Piping

For optimal efficiency and performance, the piping and extremities need to be insulated.

Why is insulation H_2O piping connection calculated on single run?

- √ Temperature loss between ODU and IDU is important not only for the comfort of the customer but also for the energy efficiency of the unit.
- √ Therefore, the required insulation for the piping is calculated on a single run

» Condition for calculation of insulation: ΔT = 2F between LWT at ODU and LWT at IDU.

» Recommend insulation for the site location.

» IECC (International Energy Conservation Code) Requires a minimum of R3 on any mechanical system carrying fluids over 105°F and below 55°F

» Be sure to adhere to local regulations

For optimal efficiency and performance, the piping and extremities need to be insulated.

Piping Length	Minimum Insulation Thickness
<65ft	¾"
65-98ft	1¼"
98-131ft	1½"
131-164ft	2"

ADDITIONAL INFORMATION

Acronyms and Definitions

- **AWHP (Air to Water Heat Pump):** a system that utilizes the thermal energy from the outside air to heat or cool water
- **AHU (Air Handling Unit):** regulate and circulate air
- **BAR:** a metric unit of pressure measurement (1BAR= 14.5PSI)
- **BTU/hr.** (British Thermal Unit per hour) the amount of heat or energy used to raise the temperature of one pound of water by one degree
- **CFM:** Cubic feet per minute
- **Circuit Setter:** regulates waterflow though a hydronic loop
- **Convector:** a device that uses convection to circulate heat into an environment
- **COP (Coefficient of Performance):** the measure of the air-to-water heat pump's efficiency. It's a ratio of the cooling or heating output to the electrical energy input.
- **ΔT:** Delta T or temperature differential
- **Differential:** the difference between the setpoint and when the system is to come back on
- **Direct return:** piping configuration utilizing the first to get heat/cool first to return to source
- **DHW:** Domestic Hot Water
- **Emitter:** a device that releases heat/cool into an environment with or without a fan
- **GPM:** gallons per minute
- **HPC (Heat Pump Convector):** Fan forced heat independent heating and cooling unit either wall hung or floor mount
- **Hydraulic Separation:** hydraulically decouples primary and secondary piping
- **Hydronics:** a cooling or heating system that uses water as a medium to transport energy from one place to another
- **Hysteresis:** Differential temperature
- **L/min:** Liters per minute
- **Lockshield:** radiator valve that controls the flow of water through the convector for balancing. Similar to a circuit setter

Acronyms and Definitions (cont.)

- **MMI:** Man-Machine Interface. The controller in the hydrobox that configures the system for maximum optimization.
- **ODU:** Outdoor unit
- **PEX (Cross-linked Polyethylene):** flexible polymer piping materials
- **Primary piping:** carries the primary flow of water for energy use to the emitters/convector
- **Primary-secondary piping:** piping design to minimize pressure drop in a hydronic system
- **PSI (Pounds per Square inch):** measurement of the force exerted on a surface
- **Pump Curve:** a graphical representation of a pump's performance based on testing conducted by the manufacturer. Each pump will have its own pump performance curve, which varies from pump to pump. This performance is based on the pump's motor horsepower and the size and shape of the impeller.
- **Radiant:** underfloor heating or wall mounted convector
- **Reverse return:** piping configuration in which the first convector to get heating or cooling will be the last to return to the primary system.
- **Secondary piping:** Piping that is "secondary" to the main heating/Cooling plant (*ALTHERMA*) example: piping to the emitters/convectors would be considered secondary piping
- **Sensible Cooling Load:** BTUs needed to be removed to lower the thermostat temperature independent of the BTUs related to humidity.
- **Volumizer:** a tank to add volume to a system

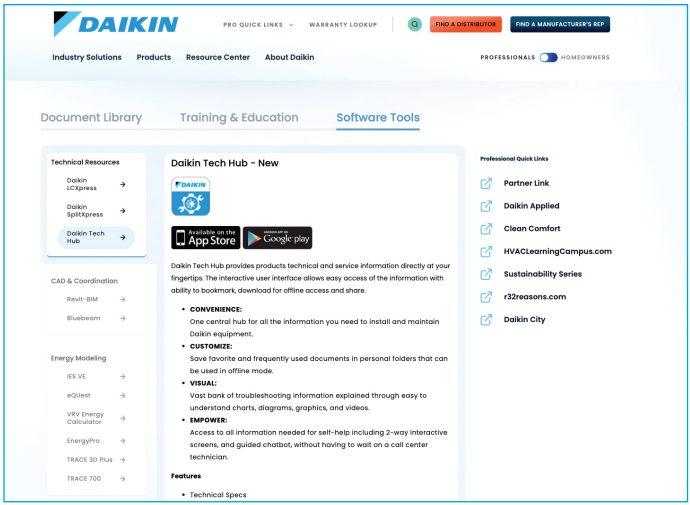
Daikin City

Daikin Comfort

***Skyport*Home App**

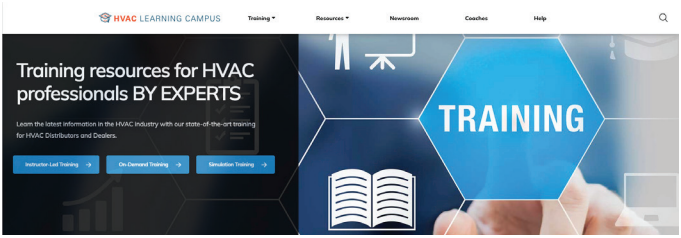
Digital Sales Tools

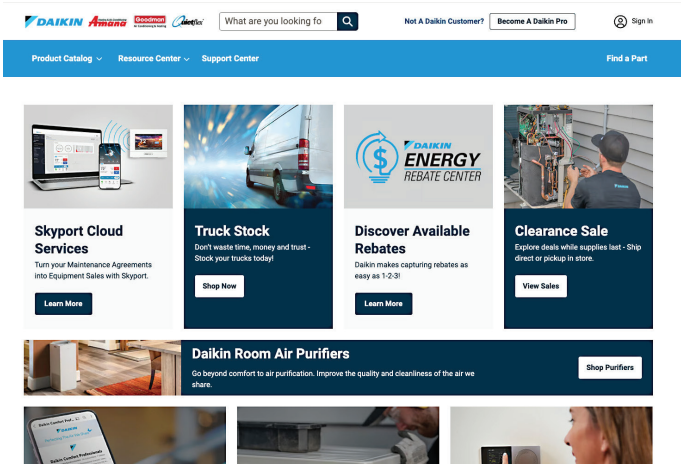
Daikin has many sources to get information and training both online and in-person can be found at Daikin Comfort.



https://daikincomfort.com/resource-center?main-tab=software-tools

www.daikincomfort.com





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History of Daikin

Revolutionizing Heating and Cooling for over 100 years.

1920s – The future of Daikin takes flight
Daikin's history begins producing radiator tubes just 21 years after the Wright brothers' first flight.

1930s – Fluorocarbon gas successively manufactured
Since this 1935 breakthrough, Daikin remains the only company that researches and develops both air conditioning fluorochemicals and hardware.

1950s – Daikin enters growing consumer segment.
Continuing to innovate and expand, Daikin launched their first residential window unit for the rapidly developing consumer segment.

1960s – Commercial production scaled-out in Osaka
The Kanaoka Factory is established as a main production base for commercial air conditioners including centrifugal chillers.

1970s – Innovation expands
Daikin creates new opportunities entering Europe, introduces "multi-split" systems and air purifiers for homes, and launches *SkyAir* for shops and small offices.

1980s – Re-imagined indoor comfort for commercial buildings
Daikin developed the *VRV* (Variable Refrigerant Volume) system, the world's first multi-split type air conditioner for commercial buildings. This development drastically innovated the air conditioning standard of commercial buildings across the globe.

1990s – More HVAC firsts
Daikin established the world's first production plant for R-32 refrigerant and launched the first mini-split air conditioner with a humidification function.

2000s – Daikin technology comes to America
Daikin acquired McQuay International, a global corporation that designed and manufactured HVAC products for commercial, industrial, and institutional use.

2010 – Air has unlimited possibilities
Daikin acquires American company Goodman Manufacturing and establishes a strong position in North American by opening the Daikin Texas Technology Park just outside Houston, Texas where Daikin launched new products, including the Daikin *FIT*, Daikin *ONE*+ smart thermostat, and new *VRV*s.

2020s – Innovation continues
The Daikin *ONE* ecosystem provides solutions to help DETECT, VISUALIZE, and ACT, addressing common indoor air quality (IAQ) issues. Goodman Manufacturing is renamed Daikin Comfort Technologies North America, Inc. to strengthen its product development capabilities and promote the usage of HVAC products that employ R-32, a low global warming potential refrigerant, combined with 2-way communicating thermostats, inverters, and heat pumps.

History of *ALTHERMA*

Daikin *ALTHERMA* was introduced into Europe in 2006. *ALTHERMA* has been the result of energy and sustainability requirements for over 20 years.

As Daikin's overall business developed favorably, it decided on all-out entry into the heating systems industry. Although summers occasionally got quite hot in European countries, the general need for heating systems is always strong.

Daikin Europe launched Daikin *ALTHERMA*, an air-to-water heat-pump system capable of providing space heating, cooling, and domestic hot water, in Europe in 2006. Since then, Daikin has steadily expanded the product lineup based on the climate and needs of European countries. For example, Daikin *ALTHERMA* 3 H HT launched in Europe during fiscal 2020 for cold regions and can supply hot water without use of electric heaters even in very low outdoor temperatures. In fiscal 2021, Daikin launched a smaller capacity model. European sales of *ALTHERMA* have grown 4.5 times since fiscal 2014. Daikin will continue with its proposal activities in regions around the world that still mainly use combustion heating. As part of this, Daikin is stepping up its efforts in North America where there is growing momentum for a shift in environmental policy.

Notes

About Daikin:

Daikin Industries, Ltd. (DIL) is a Fortune 1,000 company with more than 100,000 employees worldwide and a leading indoor comfort solutions provider. Daikin Comfort Technologies North America, Inc. (DNA) is a subsidiary of DIL, providing Daikin, Goodman, Amana Brand, and Quietflex brand products. DNA and its affiliates manufacture heating and cooling systems for residential, commercial, and industrial use that are sold via independent HVAC contractors. DNA engineering and manufacturing is headquartered at Daikin Texas Technology Park near Houston, TX. For additional information, visit www.daikincomfort.com.

For Sales and Technical Support:
1-855-DAIKIN1

For additional information, visit:
www.daikincomfort.com and/or www.daikincity.com

Additional Information
Before purchasing this appliance, read important information about its estimated annual energy consumption, yearly operating cost, or energy efficiency rating that is available from your retailer.

Our continuing commitment to quality products may mean a change in specifications without notice.

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